BACKGROUND: The most frequently reported symptoms were headache, decreased concentration, need to concentrate to read, and sensitivity to light. The least common were double vision, spots in eyes, and red eyes. The most troublesome symptoms were headache, decreased concentration, visual fatigue, need to concentrate to read, difficulty judging distances, and sensitivity to light, whereas the least troublesome were double vision, red eyes, spots, and words moving.

OBJECTIVE: Using the CROM to assess head repositioning accuracy in individuals with cervical disc disease in comparison to reference values in neck-healthy individuals

PURPOSE: To assess head repositioning accuracy (HRA) with the cervical-range-of-motion device (CROM) in individuals with cervical disc disease (CDD) in comparison to reference values in neck-healthy individuals, but also to report reliability of the CROM in individuals with CDD and in relation to the gold standard laser pointer in neck-healthy individuals.

RELEVANCE: Assessment of HRA is recommended in the management of individuals with neck disorders but has not previously been studied in individuals with CDD. Today, there is no agreement on the best method. The CROM presents many advantages, although its reliability in relation to the laser pointer has not previously been reported, and reference values in neck-healthy individuals are lacking.

METHODS: HRA in 71 individuals with CDD was compared to reference values obtained from 173 neck-healthy individuals. Reliability was estimated with ICC and SEM, for the CROM in individuals with CDD, and between the CROM and the laser pointer in neck-healthy individuals.

RESULTS: There was a significant difference between individuals with CDD and reference values for both rotation sides (P<.004); 31% of individuals with CDD were classified with impairment in HRA. Test-retest reliability of the CROM in individuals with CDD was substantial to almost perfect (ICC = 0.43-0.91; SEM, 0.8°-1.3°). Reliability between the CROM and the laser pointer in neck-healthy individuals was variable, from moderate to almost perfect (ICC = 0.43-0.91; SEM, 0.8°-1.3°).

CONCLUSIONS: Impairment in HRA was identified with the CROM in individuals with CDD and could be important to consider in rehabilitation.

IMPLICATIONS: Impairment in HRA could reflect disturbances in sensorimotor function in individuals with CDD.

THE INFLUENCE OF NECK PAIN ON SENSORIMOTOR FUNCTION IN THE ELDERLY

Suresphorn Uthaikhup, Gwendolen Jull, Somporn Sungkarat, Jutika Treelaveen

Department of Physical Therapy, Chiang Mai University, Chiang Mai, Thailand; Division of Physiotherapy, The University of Queensland, Queensland, Australia

OBJECTIVE: To investigate the influence of neck pain on sensorimotor function in elders.

BACKGROUND: Sensorimotor disturbances have been substantially demonstrated in younger to middle-aged groups with both idiopathic and whiplash-induced neck pain. However, a comprehensive range of sensorimotor functions is yet to be investigated specifically in the elderly with neck pain.

METHODS: Cross-sectional design. Twenty elders with neck pain (12 women and 8 men) and 20 healthy elderly controls (14 women and 6 men) aged 65 years and older were recruited from the general community. Tests for sensorimotor function included cervical joint position sense (JPS), computerized rod-and-frame test (RFT), smooth pursuit neck torsion test (SPNT), standing balance (under conditions of eyes open, eyes closed on firm and soft surfaces in comfortable stance), step test, and 10-m walk test with and without head movement.

RESULTS: Elders with neck pain had greater deficits in the majority of sensorimotor function tests after controlling for effects of age and comorbidities. Significant differences were found in the SPNT (P<.01), error in the RFT (frame angled at 10° and 15° counterclockwise; P<.05), standing balance (amplitude of sway): eyes open on a firm surface in the ML direction (P = .03), and total number of steps on the step test, both left and right sides (P<.01). There was also a tendency for increased amplitude of sway with eyes open and closed on a firm surface in the AP direction (P = .07). No significant differences were found in JPS and gait parameters.

CONCLUSION AND IMPLICATIONS: Elders with neck pain have greater sensorimotor disturbances than elders without neck pain, supporting a contribution of altered afferent information originating from the cervical spine to such disturbances. The findings may inform fall prevention and management programs.

COMPUTER-BASED ASSESSMENT AND TREATMENT OF CERVICOCEPHALIC KINESTHETIC SENSIBILITY

Eythor Kristjansson

Landspitali University Hospital, Reykjavik, Iceland

PURPOSE: To demonstrate audiovisually how 2 clinically important aspects of cervicocephalic kinesthesiometry, sensitivity for positions, and sensitivity for movements can be documented and treated in clinical practice.

RELEVANCE: Subtle sensorimotor impairments, like cervical position sense and cervical movement sense, cannot be detected or fully treated by hands-on approaches.

DESCRIPTION: The laser pointer can be substituted by more reliable and validated computerized methods. A 3-D wireless orientation sensor is mounted on the patient’s head and connected to a specially written software program with a standard Bluetooth interface.

EVALUATION: Research indicates that the relocation to the normal head position and to follow an unpredictable moving object on the computer screen by moving the head/neck as accurately as possible are the most appropriate clinical tests for deficits of cervical position sense and cervical movement sense, respectively.

CONCLUSION: The observed individuality in sensorimotor disturbances in patients with neck pain disorders emphasizes the importance of developing specific rehabilitation programs for specific dysfunctions, and of using objective and quantitative methods for evaluation of rehabilitation.

IMPLICATIONS: Conventional physical therapy/manuel therapy approaches may be sufficient only for patients with neck pain and minimal sensorimotor disturbances. Clinical experience and research indicate that significant sensorimotor disturbances might be an important factor in the maintenance, recurrence, or progression of various syndromes in patients with neck pain. In these cases, additional new assessment and treatment methods are needed to avert the course of chronicity.

PRAGMATIC APPLICATION OF LOGIC AND THE SCIENTIFIC METHOD TO CLINICAL REASONING EXPOSES SOME AVOIDABLE TRAPS FOR YOUNG AND OLD PLAYERS

Neil Tuttle

School of Physiotherapy and Exercise Science, Griffith University, Gold Coast, Australia; Musculoskeletal Research Centre, Griffith University, Gold Coast, Australia

PURPOSE: To explore the rationale and underlying reasoning associated with some clinical decision making.

RELEVANCE: Common clinical reasoning practices can lead to unsubstantiated conclusions through flaws in logic or the application of evidence.
Clinical examples will be presented and methods discussed that can be incorporated in everyday practice to improve the integrity of the reasoning process.

**DESCRIPTION:** Examples of reasoning processes used in clinical decision making will be used as illustrations of the underlying processes. (1) A patient with neck pain has improvement in the most limited range of motion following mobilization to C6; therefore, mobilization to C6 should be continued. (2) Patients with chronic back pain have altered patterns of muscular activity; therefore, treatment should target improving patterns of muscular activity. (3) Patients with neck pain improve with thoracic spine manipulation and there are minimal risks associated with thoracic manipulation; therefore, patients with neck pain should receive thoracic manipulation. (4) Patients with back pain get greater improvement with exercise and manual therapy combined than when receiving either individually; therefore, patients with back pain should receive both treatments.

**EVALUATION:** The above propositions will be evaluated by the application of logic, the scientific method, statistical inference, and principles of evidence-informed practice. Methods of overcoming questionable reasoning processes will be presented, including (1) rigorous interpretation of evidence from the literature; (2) application of all 0 pillars of evidence-informed practice, including clinical expertise and patient values/preferences; and (3) structuring assessment and reassessment to reduce the risk of bias.

**CONCLUSIONS:** Many common clinical reasoning practices are potentially unreliable. Flawed or incomplete reasoning does not necessarily mean that interpretations are wrong, rather that the interpretations are not necessarily right.

**IMPLICATIONS:** Robust clinical reasoning processes combined with small changes in clinical practice could improve our ability to be confident in the accuracy of clinical judgments.

**CORRELATIONS BETWEEN CHANGES IN PATHOANATOMICAL MRI FINDINGS AND CHANGES IN PAIN WITH A BOUT OF FLEXION EXERCISES IN PERSONS WITH LOW BACK PAIN**

**Eric Parent, Jokith Jacob**

Department of Physical Therapy, University of Alberta, Edmonton, Canada; Glenrose Hospital, Alberta Health Services, Edmonton, Canada

**PURPOSE:** To determine the correlations between normalized changes in lumbar MRI findings and low back pain (LBP) changes with a bout of flexion exercises.

**RELEVANCE:** Canal or foramen stenosis and disc herniations have been associated with LBP. Flexion exercises are used to treat LBP, but it is unclear if pathoanatomical changes explain pain improvements. Flexion can modify pathoanatomical finding dimensions but may not have the same effect depending on patient size.

**METHODS:** Fifty-eight volunteers with LBP, aged 18 to 65 years and with an Oswestry score greater than 20%, completed a 4-week repeated flexion-exercise program. At baseline, lumbar MRI (T12-S1) and pain ratings were obtained in the neutral supine position immediately before and after performing flexion exercises. Most patients did 30 repetitions of flexion-in-lying exercises. Lumbar vertebrae cross-lengths and canal diameter were digitized on midsagittal images. Disc perimeters, lateral foramens diameters, and canal area were digitized on midsagittal images. Normalizing consisted of dividing the absolute measurements by total vertebral cross-lengths to account for subject size. Pearson correlation coefficients were used.

**RESULTS:** Five of 60 correlations involving nonnormalized measures of MRI changes were statistically significant compared to 6 of 60 correlations involving normalized MRI changes. Significant correlations were small ($r = 0.29-0.39$ for absolute measures and $r = 0.24-0.31$ for normalized measures). Pain improved with decreases in disc perimeter (L3-L4 normalized) and increases in canal area (L2-L3 and L5-S1). Surprisingly, pain improved with decreases in canal diameter (L1-L2 absolute and normalized) and decreases in lateral foramem diameter (pain dominant: T2-L1, absolute; L4-L5, normalized; nondominant: L1-L2, normalized; L4-L5, absolute).

**CONCLUSION:** Correlations between changes in MRI findings and pain responses with flexion exercises weren’t significantly larger using normalized changes in MRI measures compared to absolute measurements.

**IMPLICATION:** Using different MRI findings, normalizing methods, or using multivariable analysis may help better explain changes in pain with flexion exercises.

**MANUAL THERAPY FOR LOW BACK PAIN: THE PATIENT’S PERSPECTIVE**

**Sarah Slater, Nicholas Taylor, Jon Ford, Andrew Hahne**

Musculoskeletal Research Centre, Department of Physiotherapy, La Trobe University, Melbourne, Australia

**PURPOSE:** To explore patient perspectives of a specific manual therapy treatment program for patients with subacute low back pain considered to be of lumbar zygapophyseal joint origin.

**RELEVANCE:** Manual therapy is a common treatment for low back pain. To date, much of the manual therapy research has used quantitative designs. Given the multifactorial and complex nature of low back pain, investigation using qualitative methods may provide valuable insight into patient perceptions of manual therapy and its effects.

**METHODS:** A specific manual therapy program was developed that primarily targeted the symptomatic lumbar zygapophyseal joints. The program also included the provision of pathoanatomical information relevant to lumbar zygapophyseal dysfunction, strategies for managing pain, inflammation, sleep disturbance, and psychosocial barriers to recovery, as well as specific motor control retraining exercises. Participants in a randomized controlled trial who undertook this program underwent a semi-structured interview. Two researchers independently coded interview data using qualitative data-analysis software and thematically analyzed the results.

**RESULTS:** Twenty participants were interviewed (7 men, 13 women), with a mean ± SD age of 43 ± 13 years and a mean ± SD duration of LBP symptoms of 16 ± 6 weeks. Participants reported improvements in their condition that included reduced pain, return to activity, improved knowledge, and increased confidence. Some participants reported negative experiences, including posttreatment soreness, but for most, these were discussed in the context of an overall positive experience. Participants placed particular importance on individual aspects of the program, including the manual therapy, exercise, information, and their experience with the physiotherapist.

**CONCLUSIONS:** Participants with persistent LBP considered to be of lumbar zygapophyseal joint origin identified a range of perceived improvements after participating in a specific manual therapy program.

**IMPLICATIONS:** A specific manual therapy program may be a suitable treatment option for patients with persistent LBP of lumbar zygapophyseal joint origin.

**THE EFFECT OF EMOTIONAL DISTRESS ON PERSISTENT PELVIC GIRDLE PAIN AFTER DELIVERY: A LONGITUDINAL POPULATION STUDY**

**Elisabeth K. Bjelland, Britt Stage, Bo Engdahl, Malin Eberhard-Gran**

Division of Mental Health, Norwegian Institute of Public Health, Oslo, Norway; Department of Orthopedics, Oslo University Hospital, Oslo, Norway; Health Services Research Centre, Akershus University Hospital, Lorenskog, Norway

**PURPOSE:** To study the association between presence of emotional distress during pregnancy and pelvic girdle syndrome (pain in the anterior pelvis and in the posterior pelvis bilaterally) 6 months postpartum.

**RELEVANCE:** The direction of the association between emotional distress and persistent pain is debated; therefore, longitudinal studies are needed.

**METHODS:** This population follow-up study included 41,421 women in the Norwegian Mother and Child Cohort Study who reported pelvic girdle pain at pregnancy week 30 during the years 1999 to 2008. Data were ob-